REMARKS-General

By the above amendments, applicants have amended the title to emphasize the novelty of the invention.

Also applicants have rewritten both the independent claims 1 by combining the original claims 1, 6, and 7, and the independent claim 10 by combining the original claims 10, 16, and 17 to define the invention more particularly and distinctly so as to overcome the rejections and define the invention patentable over the prior art. The reason of amending the original independent claims 1 and 10 are the following: applicants disclose the physical structures of LEDs in the original independent claims 1 and 10, and disclose the material systems for the LEDs of the claims 1 and 10 in the original dependent claims 6 and 7, and claims 16 and 17 respectively. McIntosh et al disclose both the physical structures and material systems of LEDs in an independent claim, such as the independent claims 1, 16, and 18. After the combination, each of the amendment independent claims 1 and 10 discloses both the physical structures and material systems of LEDs, so clearly and strongly distinguish over the prior art.

Applicants cancel the original dependent claims 4, 5, and 13, the details is discussed below.

The claims 1-4, 6, 7, 10-12 rejection under 35 USC 102 (b)

The claims 1-4, 6, 7, 10-12 were rejected under 35 USC 102 (b) since it was said "**being anticipated by McIntosh et al**".

Applicants cancel the dependent claim 4 which discloses a buffer layer, the details is discussed below.

Applicants request reconsideration and withdrawal of the rejection, since the amended independent claims 1 (the combination of claims 1, 6, and 7) and 10 (the combination of the claims 10, 16, and 17), and the original claims 2, 3, 11, and 12 of the present patent application distinguishes over McIntosh's invention under 35 U.S.C. 102 (b) for the following reasons:

(1) the **novel material systems of the active layers** of the amended independent claim **1** of the present patent application distinguishes over McIntosh's patent.

(2) the **novel material systems of the transition active layer** of the original dependent claim **3** of the present patent application distinguishes over McIntosh's patent.

(3) the **novel material systems of the active layers** of the amended independent claims **10** of the present patent application distinguishes over McIntosh's patent.

(4) the **novel material systems of the transition active layer** of the original dependent claim **12** of the present patent application distinguishes over McIntosh's patent.

(5) the **novel physical structure of the active region** of the amended independent claim **1** of the present patent application distinguishes over McIntosh's patent.

(6) the **novel physical structure of the active region** of the original dependent claim **2** of the present patent application distinguishes over McIntosh's patent.

(7) **the novel physical structure of the LEDs** of the amended independent **claims 10 of the** present patent application distinguishes over McIntosh's patent.

(8) **the novel physical structure of the active region** of the amended independent **claims 10** of

the present patent application distinguishes over McIntosh's patent.

(9) the **novel physical structure of the active region** of the original dependent claim **11** of the present patent application distinguishes over McIntosh's patent.

(10)These **novel physical features and novel material systems** of the amended independent claims 1 and 10, and the original dependent claims 2, 3, 11, and 12 **produce new and unexpected results and hence are unobvious and patentable over McIntosh's patent.**

These 10 points will be discussed in detail below.

The references and Differences of the present patent application thereover

Prior to discuss the claims and the above 10 points, applicants will first discuss the McIntosh's patent and the general novelty of the present patent application and its unobviousness over McIntosh's patent.

There are basically two criterions to distinguish light emitting diodes (hereafter called LED): one is material system disclosed for the epitaxial layer which comprises active region, cladding layers, and buffer layer, another is the detail structures of both the LEDs and the epitaxial layer.

The present patent application is classified in a crowded art, therefore even a small step forward should be regarded as significant, especially a novel material system disclosed for the epitaxial layer definitely distinguishes over prior art.

McIntosh et al disclose, in the cited prior patent 5,684,309, a white or desire color *lateral* LED comprising the following ***key characteristics elements***:

(a) A standard ***double hetero-junction*** structure comprising two cladding layers and an active region sandwiched between two cladding layers.

(b) the ***active region*** having a standard ***quantum well structure*** comprising multi active layers ***separated by multi barrier layers;***

(c) a lateral LED with two or more electrodes on the same side of the substrate.

(d) ***material systems*** of **InGaN and AlGaN** for the active layers;

(e) ***material systems*** of **AlGaN and AlInGaN** for the ***barrier layers***.

The detail description of the above ***key characteristics elements*** is the following:

(a) A standard ***double hetero-junction*** structure LED:

First double hetero-junction structure **InGaN** LED was demonstrated in 1993 by Nakamura in Japan Journal Applied Phisics, vol. 32, page L8. Since then, almost all of LEDs employ the double hetero-junction structure.

Although McIntosh et al do not use this word "***double hetero-junction***" in their claims, one of ordinary skill in the art knows that McIntosh's LEDs have a standard double hetero-junction structure. Applicants acknowledge that the Office Action Summary notices this feature of McIntosh et al's LEDs.

Edmond et al's and Kato et al's patent applications are two samples of many patent applications to employ the double hetero-junction structure.

Applicants' patent application is another sample of many patent applications to employ the double hetero-junction structure. Applicants acknowledge that the OA notices this feature.

In order to distinguish patents and patent applications that disclose a novel LED having

double hetero-junction structure, either the material systems of epitaxial layers and/or detail structures of both the epitaxial layers and the LED are employed as criterions.

The *active regions* have at least two different structures: one is a ***bulk structure***, another is a *quantum well* structure.

A *active region* of *bulk structure* comprises one or more active layers stacked to each other ***without barrier layers to separate them.***

(b) A standard ***quantum well*** structure comprises two or more active layers ***and multiple barrier layers separating/cladding each of active layers from others***, wherein the active layers emit lights. **A barrier layer is not an active layer and does not emit light.**

McIntosh et al clearly indicate in their claims that the quantum well structure for the active region is employed. To be more precisely, McIntosh et al employ the ***multi quantum well*** structure for the active region.

(c) a *lateral* LED: McIntosh et al disclose a lateral LED, i.e., a LED with all of electrodes disposed on the same side of the substrate. Although McIntosh et al do not use the word of "lateral" in their claims, one of ordinary skill in the art knows that McIntosh's LED having a lateral structure.

(d) McIntosh et al disclose material systems of **InGaN and AlGaN** for the active layers and material systems of **AlGaN and AlInGaN** for the barrier layers of a standard double hetero-junction quantum well structured white or desire color lateral LED. Each active layer is tuned to emit light of different wavelength. The combination of lights turns to white or desire color.

Applicants disclose, in the patent application, white or desire color *lateral* and *vertical* LEDs having the following ***key characteristics elements:***

(a) a standard ***double hetero-junction*** structure comprising two cladding layers and an active region sandwiched between two cladding layers. Although applicants do not use this word in their claims, one of ordinary skill in the art knows that applicants' LED having a standard double hetero-junction structure. Applicants acknowledge that the Office Action Summary notices this feature of applicants' LEDs.

(b) the ***active region*** having a bulk structure comprising first and second active layers, further comprising a transition active layer sandwiched between the first and second active layers. ***There is no barrier layer separated two active layers.*** The fist and second active layers emit lights of different wavelengths respectively. The ***transition active layer emits lights of a spectrum tuned between the first and second wavelengths*** (details are in the specification for FIGs. 1 and 2).

(c) a *lateral* LED (amended claim 1, original claims 2, 3, 8, 9) having two electrodes on the same side of the substrate.

a ***vertical*** LED (amended claim 10, original claims 11, 12) with two electrodes on the different sides of the submount respectively.

Although applicants do not use the word "lateral" and "vertical" in their claims, one of ordinary skill in the art knows that LEDs of amended claim 1, original claims 2, 3, 8, 9 have a lateral structure, and LEDs of claims 10-12 have a vertical structure.

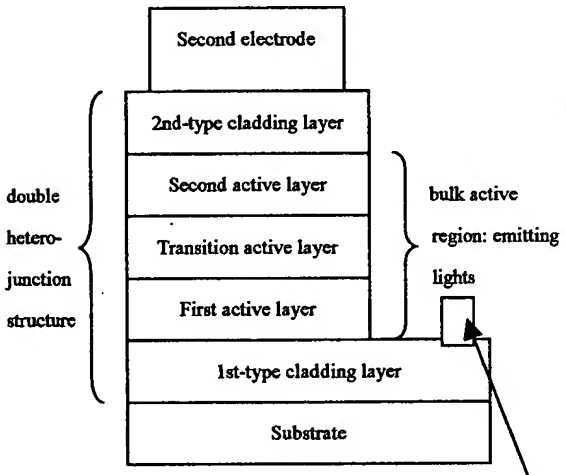
(d) ***material systems*** of **AlGaInPN** for the active layers.

(e) ***material systems*** of **AlGaInPN** for the ***transition active layers***.

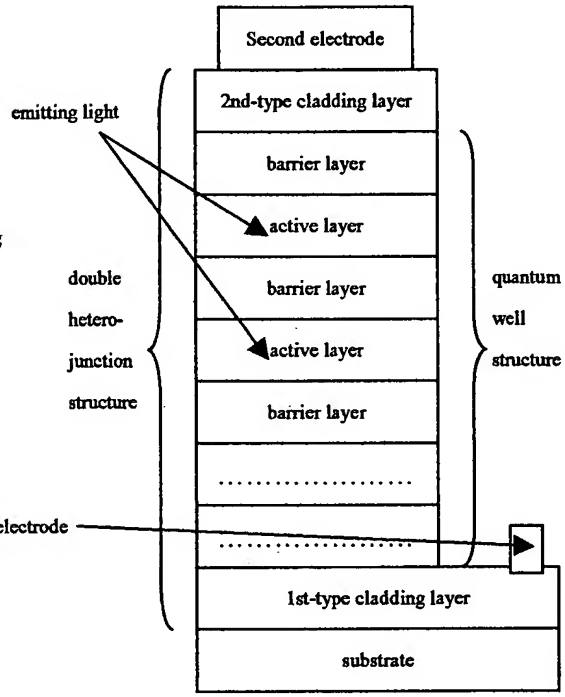
The material system of **AlGaInPN distinguishes over McIntosh et al's material system** of **InGaN and AlGaN.**

The following figures illustrate a standard hetero-junction quantum well structure lateral LED (McIntosh) and standard hetero-junction structured lateral and vertical LED with a bulk active regions (Applicants), so as to show clearly the distinctions.

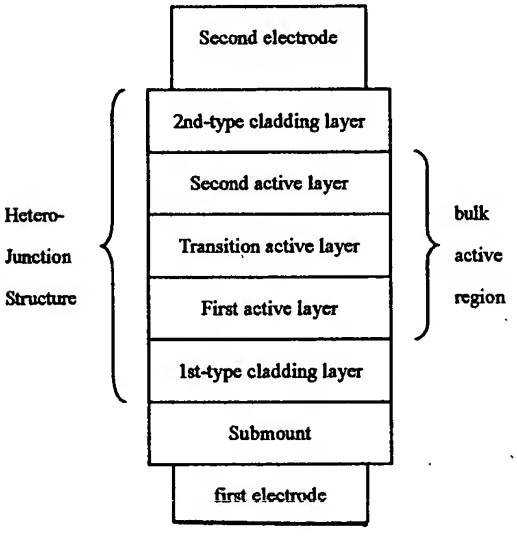
Applicants' double hetero-junction structured lateral LED with bulk active region



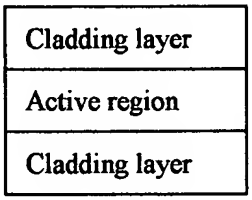
McIntosh's double hetero-junction quantum well structured lateral LED



Applicants' double hetero-junction structured vertical LED with bulk active region



A standard hetero-junction structure



The following are the applicants' response to the OA.

1. It was said in the Office Action Summary (hereafter called it OA) that:

"The claims 1-4, 6, 7, 10-12 are rejected under 35 USC 102 (b) as **being anticipated by McIntosh et al.**"

"McIntosh disclose a light emitting diode emitting of white and desire color comprising a substrate (15), an epitaxial layer comprising a first-type cladding layer(13a), a first active layer(12a), a second active layer(12b), a second-type cladding layer(13b), a first electrode(16a), and a second electrode(16b)."

This statement of the OA describes a LED comprising the standard hetero-junction structure and is **not exactly** what McIntosh et al disclose and claim.

McIntosh et al clearly indicate in the specification and claims that a **quantum well** LED is disclosed in the patent. For example, in the independent claims 1, as well as in the independent claims 16 and 18, and the specification, McIntosh et al state that

" A ***quantum well*** light emitting diode comprising:

a first ***barrier layer*** comprising **AlInGaN or AlGaN**;

a first active layer comprising **InGaN** on said first barrier layer;

a second ***barrier layer*** comprising **AlInGaN or AlGaN** on said first active layer;

a second active layer comprising **InGaN** on said second barrier layer;

a third ***barrier layer*** comprising **AlInGaN or AlGaN** on said second active layer;

....."

It is obvious that the first active layer and the second active layer are separated by the second barrier layer and, thus, McIntosh's LED has a quantum well structure as shown in FIGs. 1, 2, 3, 4, 6, 7, 8, and 9.

In the independent claims 8 and 17, McIntosh disclose a **quantum well** LED having first, second, and third active layers **separated by second and third barrier layers respectively**, and active and barrier layers have the **same material system** as that of active and barrier layers in claim 1 respectively.

In the independent claims 19, 25, and 26, McIntosh et al claim their invention as

"a plurality of stacked active layers of **InGaN**, **separated by barrier layers** of **AlInGaN or AlGaN**, ..."

Comparing with McIntosh's claims and specification, in which McIntosh claims a ***quantum well*** LED with ***material systems***, the above statement of the OA is incomplete because that two important ***key characteristics elements*** of the McIntosh's invention are missing in the OA statement, which are: (1) a plurality of ***barrier layers***, and (2) the ***material systems*** for active layers and barrier layers.

The plurality of **barrier layers is an absolutely necessary key characteristic element for a quantum well** LED. Actually all of claims and the specification in McIntosh's patent comprise barrier layers. McIntosh et al also disclose ***material systems*** for the active and barrier layers.

It is the differences in material systems and structures of both the active regions and LED that distinguish applicants over McIntosh.

Now discuss the 10 points above and what novel features applicants disclose and claim:

(1) the **novel material systems of the active layers** of the amended independent **claims 1** of the present patent application distinguishes over McIntosh's patent.

Applicants disclose the material system of **AlGaInPN** for first and second active layers.

McIntosh et al disclose the material system of **InGaN** for multi active layers.

(2) the **novel material systems of the transition active layers** of the original dependent **claim 3** of the present patent application distinguishes over McIntosh's patent.

Applicants disclose the material system of **AlGaInPN** for the transition active layer.

There is ***no*** transition active layer in McIntosh et al's invention.

(3) the **novel material systems of the active layers** of the amended independent **claims 10** of the present patent application distinguishes over McIntosh's patent.

Applicants disclose the material system **AlGaInPN** for active layers of a ***vertical*** LED.

A ***vertical*** LED is **entirely foreign** for McIntosh et al, since there is no vertical LED in McIntosh's invention. Even for a lateral LED, McIntosh et al disclose a material system of **InGaN** for multi active layers.

(4) the **novel material systems of the transition active layers** of the original dependent **claim 12** of the present patent application distinguishes over McIntosh's patent.

Applicants disclose the material system of **AlGaInPN** for the transition active layer.

There is ***no*** transition active layer in McIntosh et al's invention.

(5) the **novel physical structure of the active region** of the amended independent **claim 1** of the present patent application distinguishes over McIntosh's patent.

Applicants disclose an **active region of bulk structure** comprising first and second active layers which emit lights.

McIntosh disclose an **active region of quantum well** structured comprising multi active layers which emit lights, and **multiple barrier layers which separate active layers and do not emit light.**

There is ***no barrier layer*** in the LED of the present patent application.

(6) the **novel physical structure of the active region** of the original dependent **claim 2** of the present patent application distinguishes over McIntosh's patent.

Applicants disclose a ***transition active layer*** 103 which sandwiched between the first and second active layers and ***emits lights***.

There is ***no*** transition active layer in McIntosh's patent.

The material system and functionality of the transition active layer of the present patent application distinguishes over the barrier layers of McIntosh's patent. The **transition active layer 103** in the present patent application **is NOT the barrier layer 11b** of McIntosh's invention, although both transition active layer 103 and barrier layer 11b formed between the first and second active layers respectively.

(7) the **novel physical structure of the LEDs** of the amended independent **claims 10** of the present patent application distinguishes over McIntosh's patent.

Applicants disclose the ***vertical*** LEDs with two electrodes on the different sides of a submount respectively

A ***vertical*** LED is ***entirely foreign*** for McIntosh et al who disclose only a ***lateral*** LED

with all of electrodes on the same side of a substrate.

(8) the novel physical structure of the active region of the amended independent claims 10 of the present patent application distinguishes over McIntosh's patent.

Applicants disclose an ***active region of bulk structure*** comprising first and second active layers for a vertical LED.

There is no vertical LED in McIntosh's invention. For a lateral LED, McIntosh et al disclose an ***active region of quantum well structure*** comprising multi active layers and multi barrier layers wherein barrier layers do not emit light.

(9) the novel physical structure of the active region of the original dependent claim 11 of the present patent application distinguishes over McIntosh's patent.

Applicants disclose a ***transition active layer*** 103 which emits lights for a ***vertical*** LED.

There is ***neither vertical*** LED ***nor transition active layer*** in McIntosh's invention.

(10)These **novel physical features and novel material systems of the amended independent claims 1 and 10, and the original claims 2, 3, 11, and 12 produce new and unexpected results and hence are unobvious and patentable over McIntosh's patent.**

The LEDs with those novel physical features and material systems disclosed in the amended independent claims 1 and 10, and original dependent claims 2, 3, 11, and 12 of the present patent application emit much brighter white light, since AlInGaPN with small composition ratio of N emit much brighter yellow light than that emitted by InGaN of McIntosh's patent, and AlInGaPN with small composition ratio of P emit much brighter blue light than that emitted by InGaN of McIntosh's patent, therefore the brighter yellow and brighter blue lights are combined to a brighter white light. It is a long-felt and long existing need to have a brighter white LED.

The original dependent claims 2 and 3, and claims 11 and 12 disclose transition active layers with material system of AlInGaPN. The transition active layer is tuned to cover spectrum from blue to yellow. Combined with blue and yellow lights emitted by the first and second active layers, the white light of the LEDs of the present invention has much higher color-rendering index, i.e., closer to the sunlight. McIntosh's LEDs with limited number of active layers will not be able to emit high color-rendering index white light, since each of active layers emits light with one wavelength. The high color-rendering index of the LEDs of the present invention is unexpected result and patentable over McIntosh's invention.

The vertical LED of claims 10-12 distributes current more uniform across the surface of the LED, and thus the light extraction efficiency is improved further. Also a vertical LED with a good thermal conductive and inexpensive submount has high heat dissipation rate to reduce the working temperature of the LED, and thus the vertical white LED is disclosed for high power applications which is a long-felt, long-existing, but not resolved need.

Applicants' white LEDs therefore are vastly superior to that of either McIntosh et al, or McIntosh et al in view of Edmond et al, or any possible combination thereof. The novel features of applicants' LEDs which effect these differences are, as stated, clearly recited in the amended independent claims 1 and 10, and the original claims 2, 3, 11, and 12.

2. It was said in the OA that:

"In re claim 2, McIntosh discloses a transition active layer (11b) between the first and the second active layer."

In McIntosh's patent, ***11b is a barrier layer*** sandwiched between first and second active layers 12a and 12b as shown in their FIGs. 1, 2, 3, 4, 6, 7, 8, and 9.

McIntosh's Barrier layer 11b functions as a cladding layer and ***does not emit light.***

Applicants' transition active layer 103 in FIGs. 1 and 2 ***is an active layer and emits light.***

Therefore **applicants' transition active layer 103 is not McIntosh's barrier layer 11b, and McIntosh et al do not disclose a transition layer.**

3. It was said in the OA that:

"In re claim 4, McIntosh discloses a buffer layer(14) between the substrate and the first-type cladding layer."

Accordingly, applicants cancel original dependent claim 4 of the present patent application.

Brief:

Thus the specification, the amended independent claims 1 and 10, and original dependent claims 2, 3, 11, and 12 of the present patent application ***clearly and strongly distinguish over McIntosh's patent in both novel physical structures and novel material systems***.

Accordingly the applicants submit that the specification and claims do comply with 35 USC 102 (b) and therefore request withdrawal of the rejection.

The claims 5, 8, 9, 13-20 rejection under 35 USC 103 (a)

The claims 5, 8, 9, 13-20 were rejected under 35 USC 103 (a) since it was said "**as being unpatentable over McIntosh in view of Edmond et al.**"

It was said in the OA that:

"McIntosh discloses all the subject matter claimed except for the current spreading layer. Edmond discloses a light emitting diode having a current spreading layer (27) formed between the second electrode (26) and the cladding layer (12) to provide a contact between the second electrode and the cladding layer. Therefore it would have been obvious to one of ordinary skill in the art to form a current spreading layer in McIntosh in order to provide an Ohmic contact between the electrodes and the cladding layer as taught by Edmond et al."

Applicants acknowledge that the OA noted the current spreading layer in Edmond's invention.

Accordingly, applicants cancel original dependent claims 5 and 13.

Applicants cancel original claims 16 and 17, since original dependent claims 16 and 17 are combined into the amendment independent claim 10 to make it clearly and strongly distinguishing over McIntosh as discussed above.

There is no convincing reason presented in the OA that states why the combination of McIntosh et al's and Edmond et al's inventions may be employed as the basis of the rejection of applicants' original claims 8, 9, 14, 15, 18, 19, and 20 under 35 U.S.C. 103, and why the distinctions disclosed

by those original claims over the prior references would have been obvious.

Applicants request reconsideration and withdrawal of the rejection of the claims 8, 9, 14, 15, 18, 19, and 20, since the distinctions of the claims 8, 9, 14, 15, 18, 19, and 20 over McIntosh's patent in view of Edmond et al are submitted to be of patentable merit under section 35 USC 103 (a) because the followings reasons:

(1) **McIntosh et al and Edmond et al Do Not Contain Any Justification to Support Their Combination.**

With regard to the proposed combination of McIntosh and Edmond as a basis of the rejection of the claims 8, 9, 14, 15, 18, 19, and 20, it is well known that in order for any prior art references themselves to be validly combined for use in a prior art 35 USC 103 rejection, the *references themselves* (or some other prior art) must suggest that they be combined. For example, as was stated in **In re Sernaker,** 217 U.S.P.Q. 1, 6 (C.A.F.C.1983):

> "Prior art references in combination do not make an invention obvious unless something in the prior art references would suggest the advantages to be derived from combining their teachings."

That the suggestion to combine the references should not come from applicants was forcefully stated in **Orthopedic Equipment Co. v. United States**, 217 U.S.P.Q 193, 199 (C.A.F.C 1983):

> "it was wrong to use the patent in suit [here the patent application] as a guide through the maze of prior art references, combining the right references in the right way to achieve the result of the claims in suit [here the claims pending]. Monday morning quarterbacking is quite improper when resolving the question of non-obviousness in a court of law [here the PTO]."

As was further stated in **Uniroyal Inc. v. Rudkin-Wiley Corp.**, 5 U.S.P.Q.2d 1434 (C.A.F.C. 1988):

> ".....Something in the prior art must suggest the desirability and thus the obviousness of making the combination."

In line with this decisions, recently the Board stated in **Ex parte Levengood,** 28 U.S.P.Q.2d 1300 (P.T.O.B.A.&I. 1993):

> " In order to establish a prima facie case of obviousness, it is necessary for the examiner to present evidence, preferably in the form of some teaching, suggestion, incentive or inference in the applied prior art, or in the form of generally available knowledge, that one having ordinary skill in the art would have been led to combine the relevant teaching of the applied references in the proposed manner to arrive at the claimed invention....Our reviewing courts have often advised the Patent and Trademark Office that it can satisfy the burden of establishing a prima facie case of obviousness only by showing some objective teaching in either the prior art, or knowledge generally available to one of ordinary skill in the art, that 'would lead' that individual 'to combine the relevant teachings of the references.' ... Accordingly, an examiner cannot establish obviousness by locating references which describe various aspects of a patent applicant's invention without also providing the evidence of the motivation force which would impel one skilled in the art to do what the patent applicant has

done."

In the present case, there is no reason given in the OA above to support the proposed combination as a basis of the rejection of original claims 8, 9, 14, 15, 18, 19, and 20 under 35 USC 103 (a), other than the statement "as being un-patentable over McIntosh in view of Edmond et al."

Applicants therefore submit that combining McIntosh and Edmond as a basis of the rejection of original claims 8, 9, 14, 15, 18, 19, and 20 under 35 USC 103 (a) is not legally justified and is therefore improper. Thus applicants submit that the rejection of the original claims 8, 9, 14, 15, 18, 19, and 20 on these references is also improper and should be withdrawn.

Applicants respectfully request, if the claims are again rejected upon any combination of references, that the Examiner include a explanation, in accordance with **M.P.E.P. section** 706.02. **Ex parte Clapp**, 27 U.S.P.Q. 972 (P.O.B.A. 1985), and **Ex parte Levegood**, supra, a "factual basis to support his conclusion that would have been obvious" to make the combination.

(2) **Even if McIntosh, Edmond, and Kato were to be combined, the proposed combination would not show the novel material systems of claims 8, 9, 18, and 19.**

However even if the combination of McIntosh and Edmond and Kato were legally justified, the original claims 8, 9, 18, and 19 would still have novel and unobvious material system over the proposed combination.

Applicants disclose the novel material systems **BalInGaNP** (boron aluminum indium gallium nitride phosphide) in original claims 8, 9, 18, and 19 for the cladding layers.

McIntosh et al disclose the material systems of **GaN** for their cladding layers.

Edmond et al disclose material systems **AlInGaN** and **AlInN** for their cladding layers.

Kato et al disclose material system **AlGaN** for their cladding layers.

Applicants' material systems for cladding layers clearly distinguish over McIntosh's, Edmond's and Kato's patents under section 35 USC 102.

(3) **Even if McIntosh, Edmond, and Kato were to be combined, the proposed combination would not show the novel physical structures and novel material systems of original claims 14 and 15.**

Even if the combination of McIntosh and Edmond and Kato were legally justified, the original claims 14 and 15 would still have novel and unobvious physical structure and material systems over the proposed combination.

Applicants disclose **reflector/Ohmic layer and its materias** in original claims 14 and 15.

The **reflector/Ohmic layer is entirely foreign to** McIntosh, Edmond and Kato, or any combination thereof, since there is no reflector/Ohmic layer in their patent or patent applications.

A reflector/Ohmic layer is not a Ohmic layer. The reflector/Ohmic layer is a reflective layer to reflect light and has a good Ohmic contact to the layer it attaches to. The Ohmic layer is only for good Ohmic contact.

(4) **Even if McIntosh, Edmond, and Kato were to be combined, the proposed combination would not show all the novel physical structures of claim 20.**

The original claim 20 has novel and unobvious physical structure over the proposed combination. Applicants disclose **patterned electrodes** in the original dependent claim 20.

The **patterned electrodes are entirely foreign to** McIntosh, Edmond and Kato, or any combination thereof, since there is no patterned electrodes in their patent or patent applications.

(5) **These novel physical structures and novel material systems of claims 8, 9, 14, 15, 18, 19, and 20 produce new and unexpected results and thus are unobvious and patentable merit under section 35 USC 103 over these references**, because the following reasons:

Original dependent claims 8, 9, 18, and 19: by employing material systems of the cladding layers disclosed in original claims 8, 9, 18, and 19, the LEDs of amended independent claims 1 and 10 with AlInGaNP material systems for the active and transition active layers are much brighter than that of McIntosh's LEDs with InGaN material system, i.e., applicants' AlInGaNP LEDs emit much brighter yellow and blue lights (and thus complement into much brighter white light) than that of McIntosh's InGaN LEDs. Normally white light emitted by a white LED is a complement of blue and yellow lights emitted by the different active layers of the white LED. The AlInGaNP LEDs of the present patent application provide a solution for long felt and long existing need of high brightness white LEDs.

Edmond et al disclose a LED emitting light of single wavelength, not white light.

Kato et al disclose a double hetero-junction quantum well LED, not white LED, for improving luminous intensity.

Original dependent claims 14 and 15: Applicants disclose a **reflector/Ohmic layer** and its material in original dependent claims 14 and 15. These distinctions are submitted to be of patentable merit under 35 USC 103, because the following reasons. LEDs emit light into all of geometric directions, certain percent of light will never emit out the top surface of the LED, i.e., the light extraction efficiency is lower. By disposing a reflector/Ohmic layer between the submount and epitaxial layer, light emitted toward to the submount will be reflected back and out the top surface, i.e., the light extraction efficiency is improved up to 30-50%, which is a great improvement. The original dependent claims 14 and 15 disclose unexpected result and resolve a long felt and long existing issue of the low light extraction efficiency.

Original dependent claim 20: which is a dependent claim of the independent claim 10 and discloses **patterned electrodes.** Patterned electrodes of claim 20 disclose unexpected results: (1) a patterned electrode distributes the current over the surface of a LED more uniform, thus the emitted light is more uniform; (2) the crowding effect is reduced, thus the current density may be higher, so the emitted light is brighter; (3) the manufacture process is much simpler than that of McIntosh, thus the cost is lower.

Applicants' white LEDs therefore are vastly superior to that of either McIntosh et al and Edmond et al, or any possible combination thereof. The novel features of applicants' LEDs which effect these differences are, as stated, clearly recited in the claims 8, 9, 14, 15, 18, 19, and 20.

Brief:

Thus applicants submit that the claims 8, 9, 14, 15, 18, 19, and 20 clearly recite novel physical subject matters including physical structures of both reflector/Ohmic layer and patterned electrodes and material systems for both cladding layers and reflector/Ohmic layers, which distinguish over any possible combination of McIntosh and Edmond et al and **produce new and unexpected results and hence are unobvious and patentable over any combination of McIntosh's and Edmond's patents under section 35 USC 103 (a).**

The claims 21 and 22 are objected

Applicants acknowledge the objection of original claims 21 and 22.

It is said in the OA that:

"Claims 21 and 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewrite in independent form including all of the limitations of the base claim and any intervening claims."

Applicants request reconsideration of this objection of claims 21 and 22 for the following reason:

Original claims 21 and 22 are dependent on the original claim 20 which is dependent on the independent claim 10. The original independent claim 10 and dependent claim 20 were rejected in the OA under 35 USC 102 and 103 respectively. If this would be the case, the original dependent claims 21 and 22 should be rewritten in an independent form including all of the limitations of the original independent claim 10 and the original dependent claim 20.

However, as stated above, the amended independent claim 10 and the original dependent claim 20 disclose both novel material systems for active layers and novel physical structures of both the vertical LED and patterned electrodes, and which distinguish over McIntosh's and Edmond's patents, or their combinations and produce new and unexpected results and hence are unobvious and patentable over McIntosh's and Edmond's patents.

Applicants request reconsideration and withdrawal of rejections of the amended independent claim 10 and original claim 20, and reconsideration of objection of original claims 21 and 22.

The other reference is cited

It is said in the OA that:

"The other reference is cited to show other structure pertinent to applicants' disclose."

Applicants acknowledge the cited reference of Kato et al's patent application # 20040026705.

Attachment 1 is a **comparison chart** between Applicants, McIntosh, Edmond, and Kato, which shows that applicants' invention has novel physical features of both the LED and the epitaxial layers and novel material systems for the epitaxial layers, and distinguishes over McIntosh, Edmond, Kato, and any combination thereof. The distinctions produce unexpected results and are to be of patentable merit under 35 U.S.C. 102 and 103.

CONCLUSION

For all the above reasons, applicants submit that the specification and claims are now in

proper form, and that the claims all define patentably over the prior art. Therefore they submit that this application is now in condition for allowance, which action they respectfully solicit.

Conditional Request for Constructive Assistance

Applicants have amended the specification and claims of this application so that they are proper, definite, and define novel structure, which is also unobvious. If, for any reason this application is not believed to be in full conditions for allowance, applicants respectfully request the constructive assistance and suggestions of the Examiner pursuant to M.P.E.P. Section 2173.02 and section 2173.07(j) in order that the undersigned can place this application in allowable condition as soon as possible and without the need of further proceedings.

Very respectfully

Hui Peng

Grant Gang Peng

Applicants Pro Se

Enclose: Attachment 1

35964 Vivian Place
Fremont, CA 94536
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Certificate of Mailing. I certify that, on the date below, this correspondence and attachment 1 will be deposited with the United State Postal Service by First Class Mail, postage prepaid, in an envelop addressed to "Box Non-Fee Amendments, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450".

Date: Oct. 4, 2004

Inventor's signature:

Application Number: 10/797,339 (Peng et al) ArtUnit 2814 Amendment				
Attachment 1:	*Comparison Chart*			
Features	**Applicants**	**McIntosh et al**	**Edmond et al**	**Kato et al**
material system for active layers	AlGaInPN	InGaN or AlGaN	AlInGaN or AlInN	InGaN
material system for	AlGaInPN	no transition active layer	no transition active layer	no transition active layer
transition active layer*				
position of transition active layer	between 1st and	N/A	N/A	N/A
	2nd active layers			
material system for barrier layer*	no barrier layer	AlGaN or AlInGaN	no barrier layer	AlGaN
position of barrier layers	N/A	between active layers	N/A	between active layers
material system for cladding layer	BAlGaInPN	GaN	AlInGaN or AlInN	AlGaN
structure of LED	double hetoro-junction**	double hetoro-junction	double hetoro-junction	double hetoro-junction
	lateral and vertical***	lateral	vertical	lateral
structure of active region	bulk: two active layers plus	quantum well: multiple	bulk: one active layer	quantum well: multiple
	transition active layer	active and barrier layers		active and barrier layers
reflector/Ohmic layer	yes	none	none	none
pattened electrode	yes	none	none	none
buffer layer	yes	yes	yes	yes
current spreading layer	yes	none	yes	none
* Transition active layer emit light of whole spectrum from red to blue. Barrier layer does not emit light.				
** Double hetero-junction is a common LED structure comprising an active region sandwiched between two cladding layers.				
***Lateral LED: all of electrodes are on the same side of a substrate. Vertical LED: two electrodes are on the different sides of a substrate or submount.				

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